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Remarks

The Examiner has indicated that Claims 1-18 are currently pending herein, having withdrawn the restriction requirement put forth in the Office Action of October 8, 2003. Reconsideration and re-examination is respectfully requested in view of the below amendments and remarks.

Rejections under 35 U.S.C. §103(a)

Claims 1-4, 8, 10, 11, 15, 17 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al (U.S. Published Patent Application No. 2002/0030869) in view of Bogert et al. ("Low Crosstalk 4x4 TiLiNbO3 optical switch with permanently attached polarization maintaining fiber array"; Bogard et al.; Lightwave Technology, Journal of, Vol. 4, Issue 10, October 1986, pages 1542-1545).

Okazaki:

Okazaki is directed to an optical cross connect unit. As described in the Abstract of Okazaki, the optical cross connect unit:

"...comprising M wavelength separating sections for receiving multiplexed optical signals each having N kinds of wavelengths different from each other through M optical fibers, respectively, and for wavelength-separating each of the multiplexed optical signals into N optical signals, M optical reproduction relay sections each for conducting an optical reproduction and relay in a manner of making a conversion of each of the N optical signals, wavelength-separated in each of the wavelength separating sections, into an electric signal and then modulating it with a desired optical wavelength, a refill section for mutually refilling M sets of optical signals

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optically reproduced and relayed in the optical reproduction relay sections, a focusing section for focusing the M sets of optical signals refilled in the refill section, and a light source unit for supplying input lights having desired wavelengths to be modulated in the M optical reproduction relay sections..."

In particular, the Examiner relies on paragraph 10 of Okazaki as teaching the claimed invention. Paragraph 10 of Okazaki recites:

"...Furthermore, FIGS. 16 and 17 are block diagrams each showing the related art. As shown in FIG. 16, each of the ORs 21a' is composed of a photodiode (which will be referred hereinafter to as a PD) 21a'-1, while each of the OSs 21b' is made up of 8 LD light sources 21b'-1, an optical switch 21b'-2 for selecting one of lights (a plurality of light) from the 8 LD light sources 21b'-1, and a modulator 21b'-3 for performing the modulation of light with a given wavelength on the basis of the information converted into an electric signal (photoelectric current) in the PD 21a'-1..."

As shown in Figure 16, each optical switch of Okazaki includes 8 lasers, and thus the system of Figure 15 uses 64 lasers to modulate 8 wavelengths of data onto Od'-1.

Bogert:

Bogert describes single-polarization nonblocking 4x4 optical switch arrays, wherein "We use a crossbar switch matrix that consists of 16 individually addressable directional coupler crosspoints integrated on a single substrate..."

The Examiner states, at pages 2-3 of the office Action:

"... Okazaki et al. disclose an optical communication system comprising a first number of M fixed wavelength lasers coupled to a second number N of external modulators (N less than M) through a photonic cross-connect switch, wherein the photonic cross-connect switch is capable of routing the optical carriers of any N of the M fixed wavelength lasers to the N external modulators (fig. 16 and paragraph 0010), and wherein the N external modulators are coupled to N data signals. Okazaki does not explicitly disclose maintaining the polarity of the N optical carriers routed to the N external modulators. Boget et al. disclose an optical switch with polarization fibers used at the inputs and outputs of the switch.... It would have been obvious to one of ordinary skill in the art at the time of the invention to use polarization maintaining fibers at the input and output fibers to/from the Okazaki et al. switch, in order to maintain the polarity of signals leading into and out of the optical switch..."

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No motivation for the modification suggested by the Examiner:

In order to support a rejection under 35 U.S.C. §103(a), a motivation for modifying the references should be shown or suggested by the prior art.

Applicant disagrees with the Examiner's statement that Okazaki would desire to modify its design to use a polarization maintaining fiber 'to maintain the polarity of the signals leading into and out of the optical switch...' for at least the reason that polarization fiber is expensive, and also the reason that all embodiments of Okazaki's optical switch describe an optical to electrical conversion (or visa versa) at an input and an output. If Okazaki is generating a new signal at the output, the polarization of the signal is not maintained, but is recreated. Thus, the use of a special polarization maintaining fiber would only serve to undesirably increase the cost of Okazaki. For at least the reason that insufficient motivation for the modification suggested by the Examiner can be found, a rejection under 35 U.S.C. §103 is improper and should be withdrawn.

Combination of Okazaki and Bogert neither describes nor suggests the claimed invention:Claims 1-9:

However, assuming a motivation for modifying the references as suggested by the Examiner could be found, the combination of Bogert and Okazaki fail to disclose or suggest *every* limitation of the claims. In particular, Okazaki, which includes eight individual lasers in each of the eight optical switches, fails to disclose or suggest a system such as the claimed invention, which recites "... An optical communication system comprising *a first number M of fixed wavelength lasers coupled to a second number N of external modulators (N less than M and greater than one)* through a photonic cross-connect switch, wherein the photonic cross-connect switch is for routing the optical carriers of *any N of the M fixed wavelength lasers to the*

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N external modulators while maintaining the polarity of the *N* optical carriers routed to the *N* external modulators, and wherein the *N* external modulators are coupled to *N* data signals for producing *N* optical data streams from the *N* optical carriers and the *N* data signals...”

Applicants note that no such structure is shown in Okazaki, which describes each group of lasers being coupled to only one external modulator (rather than to the *N* external modulators of the claimed invention). Bogert, although describing the use of a polarization maintaining fabric in a cross bar switch, also neither describes nor suggests this limitation. Accordingly, for at least the reason that the combination of references neither describes nor suggests the claim, claim 1 is patentably distinct over the references, and the rejection should be withdrawn.

Dependent claims 2-9 add further patentable limitations to claim 1, depend on claim 1 and are allowable for at least the reasons described with regard to claim 1.

Claims 10-16:

Independent claim 10 recites “... A photonic cross-connect device comprising at least *M* optical inputs coupled to at least *N* optical outputs (*N* less than *M*) through *a photonic cross-connect fabric* that is coupled to the at least *M* optical inputs and to the at least *N* optical outputs via polarization maintaining fiber and is capable of routing optical signals received over any *N* of *M* optical inputs to the *N* optical outputs...”

Applicants’ can find no teaching in Okazaki of a ‘photonic cross connect fabric’ as alleged by the Examiner in Okazaki. Rather, Okazaki describes a system which uses separate lasers for each optical output. Thus, although Bogert describes a cross bar switch using polarization fiber, there is no use for such a fiber in the invention of Okazaki, which does not use a cross connect arrangement. Accordingly, for at least the reason that the combination of

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references fails to disclose or suggest the claimed invention, claim 10 is patentably distinct over Bogert and the rejection should be withdrawn.

Dependent claims 11-16 add further patentable limitations to claim 10, depend on claim 10 and are allowable for at least the reasons described above with regard to claim 10.

Claims 17 and 18:

Applicants' claim 17 is also patentable over the combination of Okazaki and Bogert, which neither describes nor suggests "... a method for producing optical data streams in an optical communication system, the method comprising ... maintaining a first number M fixed wavelength lasers, each fixed wavelength laser having an output of a different wavelength that the other fixed wavelength lasers ... maintaining a second number N external modulators, wherein the second number N is less than the first number M and greater than one ... routing optical carriers from each of a predetermined N of the M fixed wavelength lasers to a different one of the N external modulators while maintaining the polarity of the optical carriers; and ... feeding a data signal to each of the N external modulators to produce N optical data streams at N specific wavelengths..."

Thus claim 17 includes limitations similar to those that distinguish claim 1 over the combination of references. Accordingly, for at least this reason claim 17 is patentably distinct over Bogert in view of Okazaki, and the rejection should be withdrawn. Dependent claim 18 serves to further limit claim 17 and is allowable with claim 17.

Claims 5 and 12:

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Claims 5 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki and Bogert et al and further in view of Nagoaka ("Compact latching-type single-mode-fiber switches fabricated by a fiber micromachining technique and their practical applications").

Nagoaka:

The Examiner states, at page 6 of the office action "... Regarding claims 5 and 12, Okazaki et al. in view of Bogert et al. disclose the optical communication system of claim 4 and 10, respectively, but do not disclose that the photonic cross-connect fabric comprises a Micro Electro Mechanical System (MEMs). Nagoaka disclose a MEMs-based MxN polarization-maintaining optical switch design ... It would have been obvious to one of ordinary skill in the art at the time of the invention to use a Nagoaka switch design for the switch of Okazaki et al to provide the benefit of a compact and cost-effective switch, as taught by Nagoaka..."

Applicant respectfully disagrees, and notes that, as described above, Okazaki neither discloses nor suggests "a photonic cross connect fabric" but rather teaches a hierarchical switching method, with each output having a number of lasers dedicated specifically to the output. Accordingly, Applicant's disagree that the combination of references describes or suggests the claimed invention, and submit that the rejection is overcome and should be withdrawn.

Claims 6 and 13:

Claims 6 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. and further in view of Nagoaka and Tuantranout.

The Examiner relies on Tuantranout for the teaching of an MOEMs switch. However, as described above with regard to Nagoaka and claims 5 and 12, Tuantranout fails to overcome the

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inadequacies of the combination of Bogert and Okazaki with regard to the parent claims, and for at least this reason the rejection of claim 6 and 13 should be withdrawn.

Claims 7 and 14:

Claims 7 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. and further in view of Makihara.

The Examiner relies on Makihara for the teaching of a bubble (champagne) optical switching system. However, even if Makihara describes a champagne optical system, the combination of Makihara with Bogert and Okazaki fails to overcome the inadequacies of the combination of Bogert and Okazaki with regard to the parent claims, and for at least this reason the rejection of claim 7 and 14 should be withdrawn.

Claims 9 and 16:

Claims 9 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al. in view of Bogert et al. and further in view of Hakamata.

The Examiner relies on Hakamata for the teaching of a liquid crystal optical switching system. However, even if Hakamata describes a liquid crystal optical system, the combination of Hakamata with Bogert and Okazaki fails to overcome the inadequacies of the combination of Bogert and Okazaki with regard to the parent claims, and for at least this reason the rejection of claim 9 and 16 should be withdrawn.

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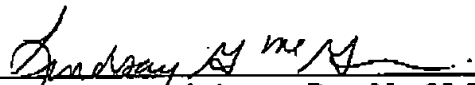
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Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicants' Attorney at 978-264-6664 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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Date


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